TESTING SPECIFICATIONS September, 1959

Type 1301-A Low-Distortion Oscillator

22 Baker Avenue
West Concord, Mass.

Test Equipment

1 - Volt-Ohmmeter
1 - Wattmeter-Voltmeter-Variac Unit
1 - Type 1800-B Vacuum-Tube Voltmeter or equivalent
1 - Type 1304-B Beat-Frequency Audio Generator or equivalent
1 - Type 1932-A Distortion and Noise Meter or equivalent
1 - Type 1301-P1 Laboratory Range Extension Unit
1 - Cathode Ray Oscilloscope
1 - A-B-C Plug-in Unit (Resistor values for unit-A = 43 K, B = 43 K, C = 21.5 K. Tolerance A = B = 2C +0.5%)
Load Resistors (600 ohms and 5000 ohms)
Standard Frequency Lines

1.0 Preliminary Checks and Adjustments

1.1 Install the Type 1301-201 "dummy" plug in the range extension Jones socket (mounted inside, on the base). Turn potentiometer R-9 fully clockwise, capacitor C-107 to $\frac{1}{4}$ mesh and C-102 and C-103 to 3/4 mesh. Connect the 60 ~ line through the Variac-Wattmeter Unit and check that the input power is not greater than 60 watts at 115 volts.

The Type 1301-A must be allowed to heat for at least one hour before proceeding with the checks.

1.2 Connect the Volt-Ohmmeter across the terminals of C-1 and adjust potentiometer R-9 to give a d-c voltage of 270. (The ultimate value of this B voltage will depend upon the hum level of the instrument with the 200 cycle frequency button depressed and with 105 line volts. See paragraph 6.2 below.)

The neon lamp must be lit and must emit a steady glow at its center electrode.

2.0 Frequency Checks

2.1 The dust cover must be in place for all high-range checks and adjustments. Standardize the frequency of the Type 1304-B Generator at 1 kc, using the CRO and the Standard 1 kc line. Depress the 5000 ohm UNBAL IMPEDANCE switch of the Type 1301-A and turn the OUTPUT control to maximum. Install a 5000 ohm load resistor (Type 500-M) across the OUTPUT terminals. Refer

to the "Notes for Padding" which are included at the end of these Specifications. All frequencies must be within ±1.5% +0.1 cycle.

2.2 X100 Range

Depress the 40 and the X100 buttons. Adjust capacitors C-102 and C-103 by approximately the same amount until the frequency is 4 kc. Check all other frequency buttons on the X100 range according to the Table I (attached at the end of these Specifications). A slight re-adjustment of capacitors C-102 and/or C-103 may be necessary in order to average the error over the range.

2.3 X1 and X10 Ranges

Check each frequency on these two ranges to the limits specified in Table I. (NOTE: An error in an individual frequency indicates an incorrect resistor; an error in an entire range indicates an incorrect multiplier capacitor.)

2.4 Install the A-B-C Plug-in Unit, release all frequency buttons and check that normal output is obtained on each of the three FREQUENCY MULTIPLIER buttons.

2.5 Remove the A-B-C Plug-in Unit and install a Type 1301-P1 Range Extension Unit. Release all three FREQUENCY MULTIPLIER buttons and depress the 5000 ohm OUTPUT IMPEDANCE button only. Check that normal output is obtained with the 15 cycle, then with the 2 cycle-button depressed.

3.0 Output Voltage Checks

3.1 Connect the 1800-B Voltmeter across the OUTPUT terminals and turn the OUTPUT control fully clockwise. Check the OUTPUT voltage at each frequency to be at least 22.5 volts with a 5000 ohm load inserted and the 5000 ohm UNBAL IMPEDANCE button depressed.

The OUTPUT must be flat within +1 db, as read on the Voltmeter, over the entire frequency range, or the maximum voltage must never exceed 1.2 times the minimum voltage (2 db). (The OUTPUT voltage on the X100 range may be adjusted by varying capacitor C-107, but see paragraph 4.1 below.)

Replace the 5000 ohm with a 600 ohm load. The Voltmeter must read at least 3.3 volts at all frequencies with either the BAL or UNBAL 600 ohm IMPEDANCE buttons depressed. (See notes on Padding.)

4.0 Check for Regenerative Oscillations

4.1 Remove Tube V-7 (Type 6SK7), depress X100 MULTIPLIER button and place the top cover in position. Using the CRO, check that the Type 1301-A does not oscillate at any point on the X100 range. Capacitor C-107

must be adjusted slightly below the point at which oscillation occurs. It may occasionally be necessary to pad an individual frequency. When this is done the frequency itself must again be checked to the limits given below.

5.0 Final Output Check

5.1 The dust cover must remain in place for the checks below. Replace Tube V-7, set the OUTPUT control fully clockwise and again connect the Type 1800-B across the OUTPUT terminals. Perform an over-all output check on all frequencies, using the limits stated in paragraph 3.1. Unnecessarily high output is undesirable because of increasing distortion. The output voltage must not show any erratic fluctuations or periodic "beating" or "hunting" effects. The latter are apt to occur at 60, 200, and above 5000 cycles. When switching from 200 to 20 cycles the output must rise to normal within one minute.

6.0 Distortion and Hum Checks

6.1 CAUTION: To avoid the possibility of serious error, the instrument used in making these measurements (Type 1932-A or 736-A) must first be checked against itself for residual distortion of much less than 0.1% at the frequencies involved. Furthermore, when a Type 1932-A is used, it must be in conjunction with a cathode-ray oscilloscope, connected to show the Lissajous pattern of output vs. input.

To check either instrument, use the signal from a Type 1301-A on 5000 ohms output with the control set at any point between 0 and 8.

Type 1932-A: Calibrate with the 100% button depressed, measure distortion and note the Lissajous pattern.
Calibrate with the 30% button depressed, measure distortion and note the Lissajous pattern.
On the B, C, D ranges of the Type 1932-A, the Lissajous figures must be identical, and the distortion measurements must agree within 0.02%, otherwise both measurements are probably incorrect. If they agree, the instrument may safely be used on all ranges by calibrating it with the 30% button depressed for all distortion and noise measurements.

Type 736-A: Perform operation 5.0 in the Testing Specifications for the Type 736-A. As an alternative:
Calibrate the instrument with the scale switch set to 300, and measure the distortion.
Calibrate, with the scale switch set at 100; measure the distortion.
All distortion components must be the same (within 0.01%) with one method as with the other when the maximum allowable input levels, as indicated on the Input Multiplier switch, are observed.

6.2 Set the Type 1301-A at 200 cycles and reduce the line voltage to 105. Using the Type 1932-A and the CRO, adjust potentiometer R-9 to obtain the minimum reading of the Type 1932-A meter.

CAUTION: Allow the plate voltage to stabilize after making a change in the setting of R-9. This requires a delay of approximately one minute.

6.3 With all dust covers in place check the distortion to be not greater than 0.1% under the following conditions and at the specified frequencies. Refer to the Padding Instructions.

FREQUENCY (cps)	OUTPUT IMPEDANCE (ohms)	OUTPUT CONTROL Set at	LOAD RESISTOR (ohms)
50	5000	"8"	5000
200	5000	"8"	5000
2000	5000	"8"	5000
7500	5000	"8"	5000
Two frequencies chosen at random	5000	"8"	5000
50	600 UNBAL	Max.	600
200	600 UNBAL	Max.	600
100	600 UNBAL	Half	600

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TABLE I

FREQUENCY CHECK TABLE

TYPE 1301-A c.p.s.	TYPE 1304-B Stnd. c.p.s.	CRO PATTERN
20	300	15/1
25	"	12/1
30	"	10/1
40	"	15/2
50	"	6/1
60	"	5/1
75	"	4/1
100	"	3/1
150	"	2/1
200	1000	1/5
250	"	1/4
300	"	3/10
400	"	2/5
500	"	1/2
600	"	3/5
750	"	3/4
1000	"	1/1
1500	"	1.5/1
2000	1000	2/1
2500	"	2.5/1
3000	"	3/1
4000	"	4/1
5000	"	5/1
6000	"	6/1
7500	"	15/2
10000	"	10/1
15000	"	15/1

INSTRUCTIONS FOR PADDING

1.) To increase over-all output:
Shunt R-24 with approximately 5 Megohms.

2.) To reduce high output:
a.) Change neon bulb (V-9),
b.) Shunt R-25 (0.51 Meg) with a 3-5 Meg. resistor)

3.) To increase 600 ohms output only (at high frequencies).
Insert two 0.01 capacitors (COW-17) across R-36 (330 ohms) and R-39 (330 ohms).

4.) To increase output at 20 cycles:
a.) Change tube V-7 (Type 6SK7),
b.) Add a 400-μμf capacitor across C-113 (located behind and above the X1 switch).

5.) To decrease individual output on the X100 range only: Add capacitance across R-121 - R-129 (depending upon the frequency button concerned). This will also reduce the frequency, making it necessary to check the latter again.

6.) To reduce high 2nd harmonic distortion:
Increase or decrease the value of R-132 (820 ohms). Use a resistance decade to determine the optimum value.

7.) To reduce high 3rd harmonic distortion:
Reduce the over-all output.

8.) To decrease the individual frequency on the X100 range only:
Add capacitance across R-121 - R-129 (depending upon the frequency button concerned). This will also reduce the output, making it necessary to check the latter again.